Worker Exposure Surveillance System (WESS)
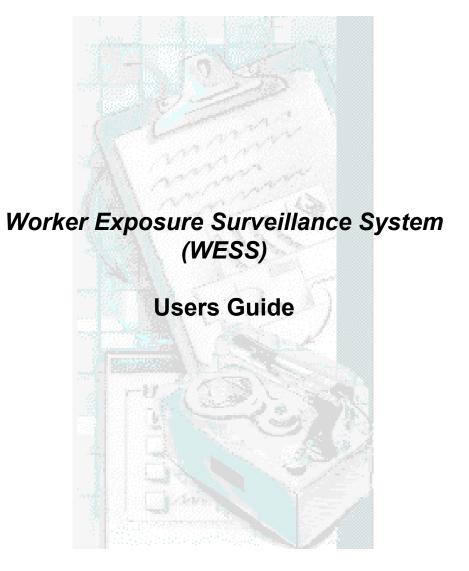
Users Guide

Worker Exposure Surveillance System (WESS)

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by
Oak Ridge Associated Universities
Oak Ridge, Tennessee
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Chapter I: Introduction

Following is a concise description of a potential exposure monitoring system including apparatus for recording worker-work area relationships and computer software for managing the data generated by the monitoring system. For a full description of the monitoring system and the details of its development, see the WESS Research Report citation on page 34 of **Chapter VII References** in this manual.

The Worker Exposure Surveillance System (WESS)

The Worker Exposure Surveillance System (WESS) is an integrated computer hardware and software system for monitoring potential exposures to workers. The monitoring system is comprised of bar code scanning devices, local or centralized data storage units, and a data management tool. The first WESS system was implemented at the Department of Energy Y-12 Plant in Oak Ridge, Tennessee as a pilot project conducted by Oak Ridge Associated Universities, Center for Epidemiologic Research for the U.S. Centers for Disease Control and Prevention under grant R01/CCR412029-01. Specifically, the WESS pilot project at Y-12 included five scanning stations, each consisting of a bar code reader attached locally to a standalone personal computer, and a sixth PC located at the ORAU/CER site. Data from the scanning stations were periodically collected and transferred to the sixth PC where the WESS database and Data Management Application resided.

The WESS scanning stations collect primary data necessary to continuously monitor worker-work area relationships. Each time a worker enters or exits a work area controlled by a WESS scanning station, the worker's badge is presented to the scanner, resulting in a record being generated that includes the worker's badge number, work area number, date and time of entry or exit, and the identity of the record as an entry (I) or exit (O) record. Once collected at the scanning stations, these records are transferred to a centralized PC where the records are stored in a Microsoft Access 95 database. A number of demographic attributes are added to the WESS database for workers previously unmonitored. Potential exposure information, chemicals or physical agents designated for each monitored location, also resides in the WESS database and can be linked to the scanning records via location, date, and date range. At this point, these records are available to the authorized user through the WESS Data Management Application.

The WESS Data Management Application

The WESS Data Management Application provides access to the database of industrial hygiene and health physics related information generated by the WESS bar code scanner stations and associated computer systems. The program is a full-featured Windows 95-based application developed in Microsoft Access 95 (version 7.0). Functions are provided for browsing, querying, and reporting of the WESS monitoring records as well as the underlying and supporting data tables which hold demographic, potential exposure, and other relational information. Specific data can be selected based on a wide range of single or combined criteria. Data also may be added or modified by users with appropriate authorization.

The WESS Data Management Application is event driven, meaning that it reacts or responds to input by the user. All functions are accessible by clicking on an appropriate command button with the left mouse button, or by pressing the **[Alt]** key and a designated "hot key" identified by an underlined character on the command button. Help for most functions is available within the application by pressing the **[Help]** button available on most screens.

Chapter II: Quickstart

This chapter is provided for users who want or need only the very primary instructions for installing and operating the WESS Data Management Application. To that end, the information provided is extremely brief and with few technical explanations. A more complete description of the WESS monitoring system and the Data Management Application is found in **Chapter I: Introduction,** and complete instructions for installing and operating the application are found in **Chapter II: Installation** and **Chapter III: Using the Wess Data Management Application**.

Purpose of the WESS System

The Worker Exposure Surveillance System uses bar code scanners and dedicated computer systems to monitor potential occupational exposures as defined by spacial relationships among workers, work areas, and potential exposure agents. The data generated by the WESS system reside in a Microsoft Access 95 relational database, and are managed by a full-featured data management application.

Installation

Installation of the WESS Data Management Application is accomplished by simply running the SETUP.EXE file on the first program disk. It is not necessary to have Microsoft Access 95 resident on the computer on which the application is installed. Once the installation is complete, execute the program by clicking on the Windows **[Start]** button, then choosing **[Programs|Worker Exposure Surveillance System]**.

Using the WESS Data Management Application

The WESS Data Management Application provides four major services:

- Online help including a broad overview of the WESS monitoring system, the dedicated data management program, and general instructions for using the program.

- A visual representation of all tables that comprise the WESS database and definitions for each field in each table.

- Functions for browsing, querying, adding to, modifying, and reporting potential exposure data previously collected by WESS bar code scanner stations. Records may be selected by a number of different parameters, singly or in combination.

- Functions for browsing, querying, adding, modifying, and reporting data in the other relational tables that comprise the WESS database.

Program functions are available by left-clicking on labeled command buttons. **Hot keys** are also provided for those preferring, or requiring keyboard access.

WARNING:
Records in the WESS database are linked by a number of different fields during various program executions. Therefore, extreme care should be exercised when editing data retrieved from more than one table, or when adding or loading records to any of the WESS tables. In some cases this can result in illogical or conflicting information, very different from that intended.

Note:
Database security for the WESS database is provided within the Microsoft Access program. Responsibility for issuing or limiting database privileges resides with individuals who install the WESS Data Management Application and who thereafter are within the ADMINS work group. It is recommended that careful planning be given to the establishment of work groups, with consideration for the degree of security preferred or required.

Chapter III: Installation

System Requirements

The WESS Data Management Application should run on any IBM PC-compatible computer system using the Windows 95 operating system. Performance can vary greatly depending on the computer's hardware configuration. Specifically, the system should have the following components:

CPU	80486 or higher (Pentium recommended)
RAM	8 megabytes (16 or more recommended)
Video	SAGA (600 X 800 resolution)
Hard Drive	15 megabytes free (Program only)
Floppy drive	3.5 inch (For installation only)
Mouse	Microsoft compatible (Not required, but strongly recommended)
Printer	Windows compatible (Required only for hard copy reports)

Installing the Software

The software is furnished on 3.5" floppy disks. The disks are not copy-protected and can be copied freely within the restraints of the license. Back-up copies should be made before beginning installation. The application should be installed through the Windows 95 Control Panel by clicking **[Start|Settings|Control Panel|Add/Remove Programs]** and following the instructions. The installation program will offer a choice of where to install, and will create a program group.

Uninstalling the Software

To uninstall the WESS Application for any reason, navigate to the **Add/Remove Programs** icon in the Windows Control Panel and follow the instructions. It is important to use the **Add/Remove** utility provided. Manual deletion of the program files or folder will not accomplish a complete uninstall and will not update the Windows 95 Registry.

Chapter IV: Using the WESS Application

Overview

The monitoring data collected from the WESS traffic monitoring stations reside in the **WorkerLocationHrs** table. Summary or collective data based on the raw monitoring data are found in the **BadgeDateLocHrs** table. Other relevant and necessary data, such as employee names, descriptions of locations, potential exposures, etc., reside in four additional tables (**WESSIDName**, **WESSIDBadge**, **LocationDescription**, and **LocationPExposure**). One other table holds information about the structure of the entire WESS database. A large number of additional files and forms also are required to manage, retrieve, display, and print information in the WESS database.

Further information regarding the components of the WESS monitoring system is provided in **Chapter I: Introduction** and **Chapter VII: Reference.** Technical support and training for the WESS Data Management Application are available from:

Oak Ridge Associated Universities/Center for Epidemiologic Research
Oak Ridge, TN, 37831-0117
423/576-3115 (voice), 423/576-9557 (fax).

Application Setup

Once the application is installed, no setup is required before operating the program. The user is encouraged to explore and test the program to determine its capability and limits. With adherence to normal Windows operating procedures, there is no reason for concern about damage to the program.

Prior to setting up a permanent database to be managed by the WESS Data Management Application, there are several steps to be taken to insure the integrity of the data. These issues are discussed in detail in **Chapter VI: Database Management**.
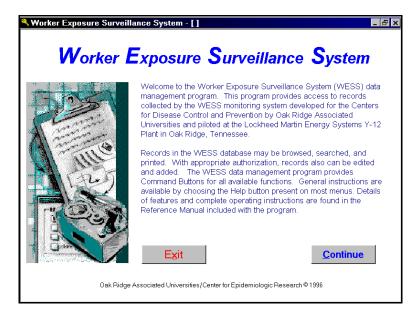
Online Help

Information about the WESS Application and instructions for its use are provided within the application in the form of text help files. This information is readily available, and usually may be accessed without quitting the present activity. Upon initial execution of the program, the user is offered a general overview of the WESS scanning apparatus and the Data Management Application. Context sensitive help files for most program functions are also available as command choices on many screens. Clicking any **[Help]** button displays the appropriate help file in a superimposed window without disturbing the current operation. In both the overview file and specific help files, **Hypertext Links** to other relevant information are shown in underlined, colored fonts. The help files also may be browsed by using the **[Page Up]** and **[Page Down]** buttons. Clicking the **[Close]** button will return the user to the precise position in the program at which the help was requested.

Starting the Application

Depending on user preferences, the WESS Data Management Application can be started by selecting the appropriate entry on the Windows 95 **Programs Menu**, double-clicking on a previously created **desktop icon** for the WESS Application, or selecting an appropriate Windows 95 **shortcut** previously added to the **Start Menu**. While loading, the welcome screen shown below is displayed. This opening screen provides some general information about the WESS System and provides a means to immediately exit the program.

The time required for program execution will vary considerably depending on system hardware, configuration, and tuning. As a reference, loading the application on a well configured 120mhz Pentium system will take approximately 6 seconds.

User Interface

The **user interface** of the WESS Application is designed to be intuitive and to encourage efficient operation. As in all Windows programs, communication with the program is done through forms. Each WESS form is displayed within a window and usually has two or more **command buttons** available for moving to a different window or initiating an action. Primary windows are maximized by default, while Help files, Error messages, and Results are displayed in **pop-up** windows of varying sizes.

Command buttons are labeled to indicate their function, but due to the limited space available on the faces of the bottons, in some cases the function of the command button may not be apparent. A more detailed description of the function of each command button (with a few exceptions) is provided by a **Control Tip** that displays automatically when the mouse cursor is allowed to rest on the command button for more than two seconds.

Program Navigation

Moving about the program, selecting data, and initiating commands are easily accomplished using a mouse or the keyboard. Virtually all program functions may be implemented by clicking once (single-clicking) with the left mouse button, assuming the mouse is configured for right handed use. Commands may be initiated either by single-clicking on the appropriate command button or by pressing the **[Alt]** key simultaneously with the appropriate "**hot key**" identified by an underlined character on the command button. Similarly, any particular data field may be selected by placing the mouse cursor anywhere within the field and single-clicking with the left mouse button. To further move within the selected data field, use the left or right keyboard cursor control keys.

User Input

For many functions the user is asked to input text data. As an example, when selecting all records for a particular worker in a particular work location, the program will first prompt the user to key in information such as **WESSID** or **Badge** to identify the worker, then prompt the user again for the work **Location** number. After responding to each prompt, the user can either press **[Enter]** or click on the **[Enter]** button provided on the prompt screen.
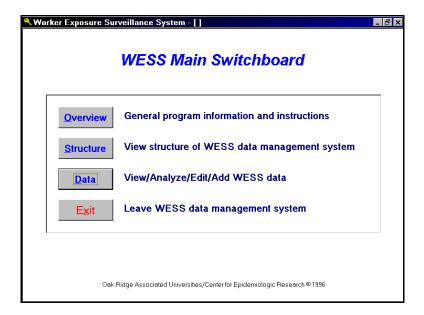
Undo

Microsoft Access always provides a means for reversing any edit change but only if the changes have not been written to the record. Changes are written to a record when the **[Enter]** key is pressed or when the edited field has lost the focus (another field has been selected). To **undo** edits, simply press the **[Escape]** key before selecting a different field.

The Database

If the user chooses to continue, the Main Switchboard screen shown below is presented, from which all data and functions are accessed. The Main Switchboard is available within a few mouse clicks from almost any place in the application.

Four major choices are available on the Main Switchboard.

Overview

A brief description of the WESS Data Management Application and concise instructions for using the application are available by pressing the **[Overview]** button. Information in this file may be viewed by paging or by jumping to specific subtopics via **Hypertext** links. Users may return to this screen at any time, and additional **Help** files with more details also are available on most screens.

Structure

A graphic representation of the WESS database tables and the relationships among them can be viewed by clicking the **[Structure]** button on the main switchboard screen. This graphic may prove useful when designing queries to segregate particular groups of records, and also may be of general use to persons not familiar with relational database structure. Descriptions of the fields in each table can be viewed by clicking on the blue headers bearing the table names.

Data

All **data resources** within the WESS database are accessed through the **[Data]** command button. Clicking this button will display the **Data Switchboard** from which the user will select to work with the raw surveillance data, relevant data directly linked to the surveillance data, or to perform summary calculations on the surveillance data. A thorough description of each data resource available via the **[Data]** button is presented in the section titled **Data Resources**.
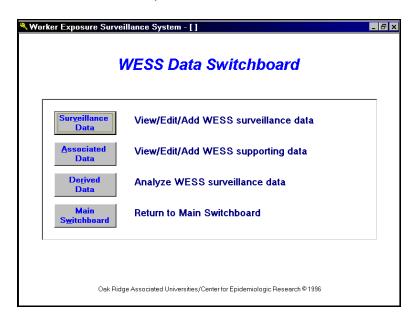
Exit

Press this command button to exit the WESS Application. If the user confirms the Exit command, all files are closed and the system is returned to its pre-execution state.

The Main Switchboard well illustrates the appearance and functionality of all subsequent form screens. Most screens will have a descriptive title, one or more labeled command buttons for application functions, a data presentation window, a **[Help]** button, and a command button to return to the previous page or to exit the current form. A single left click is used to initiate all command buttons. **Note:** The right mouse button is not implemented in the WESS Application.

Data Resources

All functions for viewing, querying, printing, editing, and adding data in the WESS database are accessed through the **Data Switchboard** shown below. Functions are categorized according to the source data or output data desired.

Surveillance Data refers to the raw data collected by the WESS scanner stations. The attributes recorded include Badge, Location, Scan Date, Scan Time, and record IOType (entry or exit). These records are the primary data that constitute the WESS database and upon which summary data are based. The raw data are logically linked to a number of other data sets, and elements from these data sets may be integrated for display or printing.

Associated Data refers to data elements that are directly related to the raw data. These include **WESSID, Name, Employment Dates, Location Descriptions and Effective Dates,** and

Potential Exposures and Effective Dates. These associated data are linked to the surveillance data by logical relationships and may be manipulated in conjunction with the surveillance data.
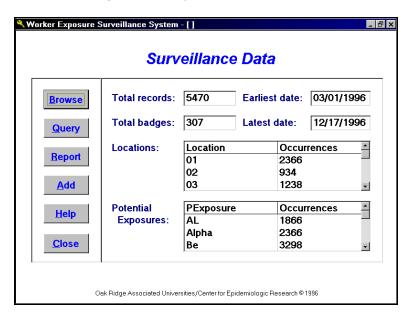
Derived Data refers to summarized or calculated values based on the surveillance data. A number of different derived values may be displayed or printed; however, since these values are calculated in real time for each request, the values are not stored in the database. The advantage of this method is that derived data will always be based on current raw data, that is, any changes in the underlying surveillance or associated data will immediately be reflected in any relevant derived data.

The following sections show the opening screens for each of the data resources and provide more details on program functions available for working with the data. Users are encouraged to practice with the data set generated during the development of the WESS system, and which is included with the application, before using the application with actual monitoring data.

Note: Backing-up data files is an important part of database management and will likely prevent serious database problems at some time during the use of all dynamic databases. It is recommended that the WESS database administrator initiate and maintain a structured back-up protocol before using the WESS application with actual monitoring data. Users are also referred to **Chapter VI: Database Management**.
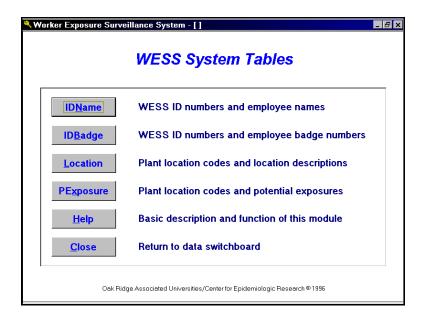
Surveillance Data
The **Surveillance Data** screen shown below provides access to all functions available for working with the primary WESS surveillance data generated by the WESS scanner stations.

The screen also displays basic descriptive statistics pertaining to the surveillance data. This statistical display is "alive", meaning that it is composed in real time from the surveillance data and therefore will always reflect the current status of the database.

Command buttons are available to **Browse, Query, Report,** and **Add** records to the WESS database. Browsing is analogous to walking through the park. Querying provides a means to select the data for display or editing. Reporting also provides a means to select the desired set of records, and also provides a means for producing formatted reports of the selected data. Pressing the **[Add]** button will provides means to add single records or data files to the database.

Associated Data

A number of other sets of data relevant to the surveillance data are stored in the **WESS System Tables**. These data include employee names and effective dates for name changes, plant WESSID numbers, descriptions of work locations and effective dates for changes in location descriptions, potential exposures (PExposures) designated for each work location, and effective dates for changes in these potential exposures. These data are logically related to the information in the raw surveillance records collecte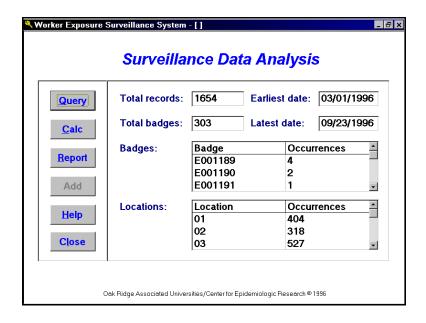d by the WESS scanner stations. The associated data elements may be displayed or printed alone, or electronically linked in various combinations with the raw surveillance data. Some of the attributes in the associated data also may be used as criteria when constructing queries for selecting specific subsets of records.

Care should always be exercised when editing or adding data in the WESS database. Extreme caution is recommended when making changes in the WESS associated data tables. Ordinarily, changes in these tables should not be necessary. However, there are exceptions to this rule, such as correcting a misspelled name or modifying a location description. It should be recognized that the data in these tables are uniquely related to the surveillance data, and changes in the associated data may result in illogically linked records. For this reason, only persons with appropriate authorization (data privileges) are able to make changes in the associated data tables.

Derived Data

Pressing this command button presents another menu providing access to all functions available for retrieving basic summary data derived from the WESS surveillance records, or calculating more complex summary data derived from the basic summary data.

The primary derived data reside in the **BadgeDateLocHrs** table, although data from other tables are linked to this table and may be included in output from queries and summary calculations. Records from this table may be selected for viewing or reporting based on the same criteria described for the surveillance data, including WESSID, Badge, Location, PExposure, Date, and Date Range. However, the selected records will present summary data rather than individual surveillance records.
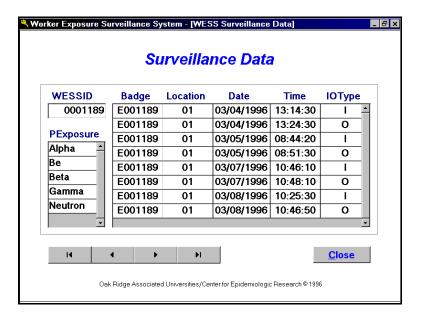
The **[Calc]** function is available only when working with derived data and provides means for generating a wide variety of calculated summary data. Examples of the type of summations that can be calculated are distribution of employee-hours by location, or total hours spent in a selected location by all employees during a defined period of time.

Records may not be added to the **BadgeDateLocHrs** table, but users with appropriate authorization (database privileges) can make modifications to the existing records. Care should always be exercised when making changes to the WESS database, but because of the special nature of the summary data in the **BadgeDateLocHrs** table, **extreme caution** is recommended when making changes to the summary records. If modifications to the WESS database are necessary, it is **strongly recommended** that these changes be made to the **WorkerLocationHrs** table that holds the underlying raw data. Changes made to the summary data without making corresponding changes to the underlying surveillance data will result in database errors that may not be obvious, but that may produce serious detrimental results.

Note that calculated results are generated in real time and are **not stored**. Any changes made to the underlying data will be immediately reflected in any queries or reports that include calculations based on the changed data.

Program Functions
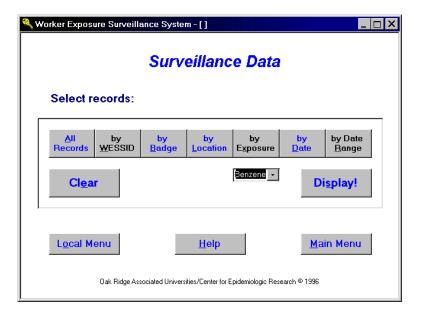
Browsing

Clicking on the **[Browse]** button provides a composite display of the WESS surveillance data organized by WESSID. Scroll bars are available to browse among records for the selected WESSID; navigation buttons are used to move to a different WESSID for record browsing. As the function name describes, the [Browse] function is for serially moving through the database. Means are not provided for searching for specific records or sets of records to browse. When specific records are to be selected, the **[Query]** function should be used.

Because the browser collects and organizes the displayed records from the entire database, performance may be slow. Factors affecting browsing speed include database size, number of records associated with the selected WESSID, and computer hardware.

Querying

The screen shown above is used for selection of records from the surveillance data for querying and printing. Similar screens are available for selection of records from other data sets, but will have appropriately different choices for selection criteria. Some text and command buttons on selection screens may be different when selecting records for printing. General instructions for selecting records is available by pressing the **[Help]** button. The **[Local Menu]** button returns to the Data Switchboard screen; the **[Main Menu]** button returns to the Main Switchboard.

Records in the WESS surveillance data set may be selected for viewing, editing, or reporting based on a number of different criteria including WESSID, Badge, Location, PExposure (Potential Exposure), Date, or Date Range. Additional criteria available for selection of records from other data sets include Employee Name and Effective Dates for changes in Name, Location Description,
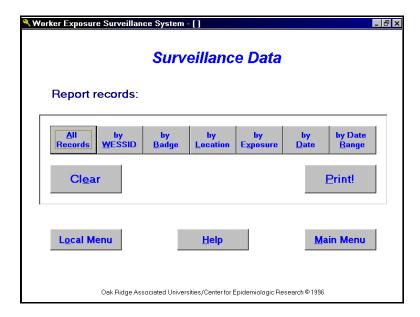
and Potential Exposure. Note that when selecting records based on Employee Name, the query engine will accept **text strings**, or partial names, as the values on which to search. However, depending on how closely the criterion values match the actual name sought, more than one match for the input values may be returned. In many cases this will not be a problem. If the user only needs to view the targeted name for spelling or to retrieve an individual's Badge or WESSID, navigation buttons will allow the user to scroll through the set of records selected by the imprecise search criterion values.

Clicking any of the **[Query]** command buttons will prompt for a selection criteria value, or provide a drop-down menu (pick list) of possible values. Criteria for records selection may be chosen singly or in combination. Some combinations are not available, because the results would be redundant or illogical. When these criterion combinations are requested, a message is displayed indicating that no selection set is available for the criteria chosen.

To perform a query, click on the appropriate command buttons for the selection criteria to be used. Initially, the text on all command buttons is **blue**. When command buttons for selection criteria are pressed, the text on the buttons changes to **black**. The example screen above shows that the user wishes to display records selected by WESSID, PExposure, and Date Range. After all criteria are chosen, pressing the **[Display]** button executes the query and displays the resulting data set. An example screen showing a record set resulting from such a query is shown in the *Editing* section on page 22.

Relational data may be queried in numerous ways, and it would be impractical to provide programmed queries for even a majority of the possibilities. Therefore, if other queries are needed, different from those provided, it will be necessary to interact with the WESS database at the Microsoft Access program level and outside of the WESS Data Management Application.
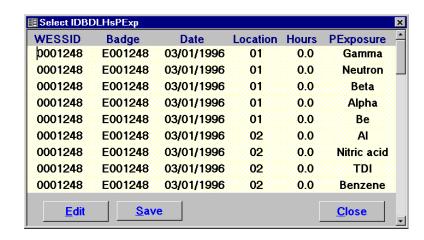
Printing

A number of predesigned reports are available for printing data from various WESS tables. Considerable flexibility is provided to the user in determining the data to be included in the reports and the order of presentation of the data. Selection algorithms for reporting are quite similar to those available for querying the same data sets. When the specified selection criteria will likely result in a very large print file, a warning to this effect is issued. The user can then choose to cancel the print job, preview the output, or continue the print job.

Reporting formats are traditional, with breaks on major selection parameters and with a semi-formal layout. Reports may be previewed and canceled before actually outputting to the printer. Reports should be possible on any laser or inkjet type printer with a Windows-compliant driver.

As in querying, the number of possibilities for reporting data from the WESS database is almost limitless. Microsoft Access has the capability to produce publication quality reports on data selected on virtually any criteria. If particular reports are required, other than those predesigned, it will be necessary to interact with the WESS database at the native DBMS level using the Access application.

Editing

Persons with proper authorization (necessary database privileges) may edit existing records in most of the WESS database tables. Editing is performed after selection of records by querying. When records are first selected they are not editable, because the file is opened in read-only mode. If editing is necessary, clicking on the **[Edit]** button changes the file to edit mode. After editing, changes should be saved by clicking the **[Save]** button.

Care should be exercised when editing any data, but extreme caution is recommended when editing data retrieved from more than one table, or when editing data from a single table that holds

data derived from more than one table. An example of the latter case is the BadgeDateLocHrs table. The data and calculated values from this table are based on underlying records that represent real-time information that in most cases should not need to be edited. If editing is necessary, it is recommended that the data to be changed first be reviewed and possibly printed. Note that in some cases, changing the data in BadgeDateLocHrs may produce illogical results or results very different from expected.

Entering Records
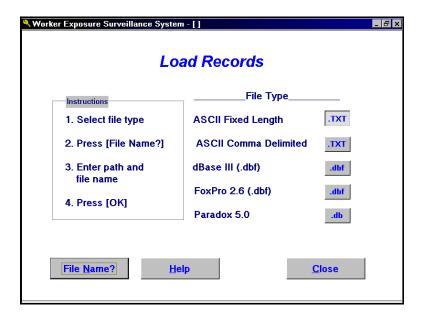
Users with appropriate authorization (database privileges) can add single records to the WorkerLocationHrs table through the data entry form provided. It is not necessary to enter data in every field, **however**, doing so may result in query or linking problems later. During entry, moving from field to field is accomplished by pressing either the **[Tab]** or **[Enter]** key. A record is saved by pressing **[Enter]** after the last field or clicking on the **[Save**

Record] button.

While adding single records should not be necessary often, the **[Add]** function may be useful when appending records to the WESS database that were excluded during normal loading of data. **Extreme** care should be exercised when entering records, for a number of reasons. First, the possibility of errors being incorporated in the database is much greater when entering records by keying. Secondly, the WorkersLocationHrs table houses the primary data within the WESS database, and results of all summary calculations based on this table will immediately reflect any changes made in the table. In particular, care should be exercised when entering data related to Badge number or Location. Entry errors in these fields can produce Query results very different from that expected. Note that within the application, records with errors can be edited, but cannot be deleted. It is possible of course to edit and delete records when interacting with the WESS database at the native Microsoft Access Application level.

Loading Data Files


```
Worker Exposure Surveillance System - [ ]      _ ⊡ ✕

                    Load Records

    ┌─Instructions─────┐        ____File Type____
    │ 1. Select file type    ASCII Fixed Length      .TXT
    │
    │ 2. Press [File Name?]   ASCII Comma Delimited   .TXT
    │
    │ 3. Enter path and       dBase III (.dbf)        .dbf
    │    file name
    │                         FoxPro 2.6 (.dbf)       .dbf
    │ 4. Press [OK]
    └──────────────────       Paradox 5.0             .db


        File Name?          Help              Close
```

Persons with appropriate authorization (database privileges) can upload multiple records to the WESS database using the **Load Records** screen shown. Records may be loaded (imported) only into the WorkerLocationHrs table and must comply with a prescribed file layout. Records may be in any of five formats listed below and described in the local **File Specifications** Help file.

File formats for uploading data into WorkLocationHrs table.

- ASCII (fixed length
- ASCII (comma-delimited)
- dBase III
- FoxPro 2.6
- Paradox 5.0

If records are in other formats, or data elements (fields) oriented differently, it will be necessary to reformat the input file to match specifications shown.

Care should be exercised when importing records into the WorkersLocationHrs table, since these records are the primary data upon which all empirical and derived results depend. It is recommended to first import test data that can be easily recognized (for subsequent deletion) as a trial, before attempting to load actual monitoring data.

Of course, persons with proper database privileges also can load data into any of the WESS database tables using the native Microsoft Access application. While this may be necessary at times, and may even be useful under certain circumstances, extreme care is recommended when doing so, because of the potential for database corruption.

Chapter V: Security

Security Issues

Prior to being collection of monitoring data using the WESS
system, thought should be given to the level of security necessary
or desirable to maintain the integrity of the database once it is
populated. A structured and logical security policy will greatly
decrease the possibility of data loss, either accidentally or
intentionally. The security policy should provide convenient
access to the database for all users to the depth of each user's
need while limiting unnecessary access.

Security Implementation

All security functions are implemented within the Microsoft Access
application. Access to the data may be enforced at the database
or individual database table level. Further, access may be
precisely defined according to particular database functions. To
illustrate, users may be issued privileges as follows:

1. Access to entire database with all functions,
2. Access to entire database but with restrictions on specific
   functions such as adding new records,
3. Access to entire database but with read-only privileges, or
4. No access to database.

Decisions on the level of privileges assigned to users should be
made carefully with consideration of the users' needs for access
and the overall security of the database. Usually, database
privileges are issued by the individual(s) with administrative
responsibility for the database. Initially, these persons will be in a
"work group" designated by Microsoft Access as the Admin work
group. Additional work groups can be added with various levels of
access.

While privileges can be issued at the individual user level, it is
highly recommended that privileges be assigned at the work group
level. This greatly simplifies security tasks for a number of
reasons. First, rather than needing to issue repetitive sets of
privileges to each user, a single set of privileges can be assigned
to a work group to which any number of persons can be included.
Later, when an individual no longer has need for database access,
all privileges are withdrawn by simply removing the individual from
a specific work group. Also, when it is necessary to change the
level of access for multiple persons, this is much easier
accomplished by making the necessary changes to the
appropriate work group rather than making changes to each
individual's access profile.

Additional information on security issues and implemention of
security plans is available in the Microsoft Access help files and in
many independent publications on Microsoft Access. Several of
these publications are cited in **Chapter VII: Reference** of this
volume.

Chapter VI: Database Management

Good Database Management Practices

The most carefully collected data residing in a powerful and elegant database management application will soon be in jeopardy unless good database management policies are implemented. A thorough discussion of this subject is outside of the scope of this manual, however, many excellent volumes are readily available to provide guidance in establishing and maintaining a sound database management system. Within this chapter, the basic topics of database management that should be considered will be presented along with general recommendations.

Backing-Up Data

Why back-up data? All experts in the field of database management will attest that at some time, a situation will occur when data will be lost if a back-up copy does not exist. It is not a matter of "if"; it is a matter of "when". A formal back-up policy should be developed and appropriate procedures integrated into normal data management operations. While no back-up function is included within the WESS Data Management Application, nor in the native Microsoft Access application, this presents no problem. All of the files that comprise an Access database are incorporated in a single DOS file with the following naming convention:

Database Name.MDB

It is possible to "split" the database tables from the other elements of the database to segregate the dynamic part (tables) from the static part (forms, reports, macros, VBA code, etc. If the user chooses to split the database, the database will then consist of two MDB files. Any DOS or Windows utility can be used to copy (either compressed or uncompressed) the WESS MDB files to any storage device and medium available.

Database Integrity

In addition to regularly backing-up the WESS database, three other procedures should be implemented as formal maintenance procedures to minimize the possibility of data loss. Two of the procedures, **compacting the database** and **repairing the database,** are performed within Microsoft Access while the third recommended procedure (**defragmenting the database**) is performed outside Microsoft Access at the operating system level.

Compacting Database

Any change in the WESS database (adding, loading, or modifying records) can result in disorder of the electromagnetic data on the mass storage device, usually a hard drive. This situation is **not** a fault of the WESS or Access applications, nor does it present a problem unless the disordering is excessive as a result of many changes being made to the database. When excessive disordering does occur, performance may suffer.

Microsoft provides a simple and convenient means to reorder the electromagnetic data on the storage device without any special manipulations required of the user within the database application. From the main Access menu, select

Tools|Database Utilities|Compact Database

and follow the instructions provided. Compaction of the database should be performed routinely by the database administrator, after backing-up the database.

Repairing Database

Under certain circumstances it is possible for the WESS database to become corrupted. There are many events that may result in database corruption such as abnormally exiting the database application, or loss of power while changes are being made in the database. Often, the cause of data corruption can not be determined with confidence. Microsoft provides a utility

specifically for detection of database errors and repair of the database when possible. It should be noted that in some cases a database can not be repaired, and in this situation, the corrupted database should be replaced with a back-up copy.

It is recommended that the database administrator regularly perform a database repair procedure, after backing-up the database. From the main Access menu, select

Tools|Database Utilities|Repair Database

and follow the instructions provided.

Defragmenting Hard Drive
During any normal computer operations involving writing to the hard drive (installing software, deleting files, moving files, editing data, etc.), file fragmentation occurs. Simply put, fragmentation exists when DOS files are stored in noncontiguous areas on the drive. Fragmentation is not an error condition and is not caused by any flaw in the operating system nor in any application. When fragmentation is not excessive, it presents no problem to the user. However, files can become fragmented to the point where performance suffers. This can be observed in longer times being required to search data sets or collect specific records for display.

When excessive fragmentation occurs, the drive should be defragmented. Microsoft provides a defragmenting utility specifically for this purpose. Other vendors also supply defragmenting utilities, but their compatibility and safety may not be as certain as with the Microsoft utility. It is recommended that the database manager periodically defragment the hard drive where the WESS database resides, **after** backing-up the data.

Performance Issues
As with all applications, a number of factors will affect performance of the WESS database management application. A thorough discussion of all of these factors is outside the scope of this manual, but a plethora of literature is available on the subject. Here, a brief discussion of the major factors affecting performance is presented.

The WESS application was developed on a 120 MHZ Pentium CPU computer with industry-standard components such as the hard drive, video adapter, etc. Response as measured by display of forms should be almost immediate on any computer of this power, assuming that no data are being selected for populating the form. When data are being selected for population of a form, the amount of time for display will increase with the size of the database being searched. Considerably more time may be required to retrieve data from multiple tables. Processing of data for printing of reports often takes somewhat more time because of the need for formatting the data. The actual time for printing reports will chiefly depend on the performance of the printer. Modifying single records usually will be almost instantaneous, while the time required for loading of data files will again increase with the size of the file being loaded.

During development of the application, performance was observed on computers with CPUs ranging from a 486DX-33 to a Pentium 133. Significant differences in performance were noticeable, particularly in machines with less than 16 megabytes of RAM. Overall, performance on any properly tuned 486DX-33 or faster computer should be satisfactory. Performance is a subjective matter, and each user will have to determine if and when performance is unsatisfactory.

Following is a list of items (not in order of significance) generally known to affect computer performance:

- CPU speed
- Amount of RAM memory
- Hard drive access and data transfer speeds
- Size of database
- Degree of file fragmentation
- Indexing of database files
- Network

Problems

As of issuance, there were no known bugs or other major problems in the WESS database management application. Extensive efforts were made to make the application as "bullet-proof" as reasonable. Of course, differences in computer configurations can demonstrate or elicit problems previously undetected. Also, misuse of the operating system or the application, such as improperly exiting from the application or from Windows, can result in corrupted files that may produce a variety of problems when the application is next used.

General instruction and training on operation of the Windows environment and Windows applications are available from hundreds of written, audio, video, and personal resources. A large number of resources focused on database design and management are also available .

Chapter VII: References
Published Reference Sources

The following references are provided as sources of information on the WESS system, the Microsoft Access DBMS, and database principles in general.

1. Access 95 Unleashed. Dwayne Gifford, et al., Sams Publishing, 1996.
2. Microsoft Access Relational Database Management System for Windows 95 - Building Applications, Microsoft Corporation, 1996.
3. Microsoft Access/Visual Basic Step by Step. Evan Callahan, Microsoft Press, 1995.
4. Improved Systems for Worker Exposure Surveillance. Research Report for Grant R01/CCR412029 prepared for The Centers for Disease Control and Prevention. Oak Ridge Associated Universities, June 30, 1997.
5. Special Edition Using Access 95. Roger Jennings, Que Corporation, 1996.
6. Visual Basic 4 Unleashed, Scott, Shannon, Font, Hatfield, et al., Sams Publishing, 1995.

Technical Support

Basic and advanced training for using the WESS application as well as technical support are available from ORAU. Any questions regarding this software or information in this manual should be directed to:

Oak Ridge Associated Universities
Center for Epidemiologic Research
P. O. Box 117, Oak Ridge, Tennessee 37830 USA
1-423-576-3115 (voice) - Monday-Friday 8:00am-4:30pm EST
1-423-576-9557 (fax)

Notes

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Oak Ridge Associated Universities

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